

## REMARKS

Applicants believe the present response to be a full and complete response to the Office Action of March 8, 2007. Claims 1-3, 5, and 8-20 are currently pending and presented for further examination. Claims 1 and 5 have been amended. Claims 4 and 6 have been canceled without prejudice. Claims 8-20 have been added. No new matter has been added by the present amendment. Support for the amended claims can be found throughout the original specification and claims and in particular on page 9, lines 21-24 of the specification. Support the newly added claims can be found throughout the original specification and claims and in particular on page 4, lines 11-22; page 5, lines 7-15; page 9, lines 5-7; and page 11, lines 1-5 of the specification. Reconsideration and the timely allowance of the pending claims, in view of the following remarks, are respectfully requested.

In the Office Action dated March 8, 2007, the Examiner rejected claims 1-2 and 4-5 under 35 U.S.C. § 102(b), as being allegedly anticipated by Takahashi '713 (Japanese Published Patent Application No. 08217713) or, in the alternative rejected claims 1-2 and 4-5 under 35 U.S.C. § 103(a), as allegedly being unpatentable over Takahashi '713; and rejected claims 1, 3 and 6-7 under 35 U.S.C. § 103(a), as allegedly being unpatentable over Takahashi '713 in view of Shinagawa '530 (Japanese Published Patent Application No. 09124530).

Applicants respectfully traverse the prior art rejections, under 35 U.S.C. § 102(b), 103(a), for the reasons presented below.

### I. Prior Art Rejections.

As indicated above, independent claim 1 positively recites, *inter alia*, that the catalyst used in the condensation reaction of the fluorenone and phenolic compound includes a hydrochloric acid ***aqueous solution***. Applicants respectfully submit that Takahashi '713 fails to anticipate or render obvious the claimed invention. For example, the Examiner indicates that Takahashi '713 discloses a method for producing a fluorene derivative which comprises subjecting fluorenone and a phenolic compound to a condensation reaction in coexistence with a mercaptocarboxylic acid and a hydrochloric acid to obtain a fluorene derivative which

is then purified. (See, Office Action, page 3). However, regarding the catalyst used in the condensation reaction, Takahashi '713 states that “conventional catalysts can be used” and lists a combination of  $\beta$ -mercaptopropionic acid and hydrogen chloride **gas** as an example of catalysts that can be used. (See, Takahashi '713, paragraph number [0010]). Further, in all the Examples provided in Takahashi '713 hydrogen chloride **gas** is used as the acid catalyst. As such, Takahashi '713 clearly fails to teach or suggest catalyzing the condensation reaction with a hydrochloric acid **aqueous solution**.

Accordingly, Takahashi '713 is not drawn towards improving the characteristics of condensation reaction by using a novel catalyst – rather, it is drawn to a method of recovering unreacted phenol that is characteristic of an inefficient conventional condensation reaction of a fluorenone and a phenol. For example, Takahashi '713 states that by “adding the solvent having a boiling point higher to the condensed reaction mixture of fluorenone and the phenol, unreacted phenol can be recovered efficiently. Accordingly, the present method is economically advantageous as an industrial production.” (See, Takahashi '713, paragraph number [0025]). However, the conventional catalyst described by Takahashi '713 is discussed extensively in the BACKGROUND ART section of the specification of the instant application. (See, page 2 of the specification). In these discussions, Applicants identify the problems with using  $\text{HCl}_{(g)}$ , including the need for complying with safety measures and environmental protection that is inherent in using  $\text{HCl}_{(g)}$ .

Additionally, Applicants provide comparative examples using  $\text{HCl}_{(g)}$  instead of a hydrochloric acid **aqueous solution** of one embodiment of the present invention to show the comparatively impure and non-transparent fluorene derivative that is obtained by using the  $\text{HCl}_{(g)}$ . (See, page 20, line 10 through page 22, line 14 of the specification). In particular, Example 1 discloses using a hydrochloric acid **aqueous solution** catalyst of one embodiment of the present invention, to obtain 9-9-bis(4-hydroxy-3-methylphenyl)fluorene with a purity of 99.6% by weight and a b value of 1.3 indicating the product is colorless and transparent. (See, page 19, lines 10-14 of the specification). Contrastingly in Comparative Example 1 using  $\text{HCl}_{(g)}$ , 9-9-bis(4-hydroxy-3-methylphenyl)fluorene is obtained with a purity of 95.2% by weight and a b value of 12.5, indicating a light yellow color to the product. (See, page 21, lines 12-17 of the specification). Similarly, in Example 2 using a hydrochloric acid **aqueous solution** of one embodiment of the present invention, a 99.3% by weight 9,9-bis(4-hydroxyphenyl)fluorene with a b value of 1.7, indicating the product is colorless and transparent, is obtained (see, page 19, lines 16-25 of the specification) compared to in

Comparative Example 2 using HCl(g), a 93.9% by weight 9,9-bis(4-hydroxyphenyl)fluorene with a b value of 18.5, indicating the product is light yellow, is obtained. Additionally, in Example 3 using a hydrochloric acid **aqueous solution** of one embodiment of the present invention, a 99.0% by weight 9,9-bis(4-hydroxy-3-phenylphenyl)fluorene with a b value of 1.8, indicating the product is colorless and transparent, is obtained (*see*, page 19, lines 16-25 of the specification) compared to in Comparative Example 3 using HCl(g), a 96.1% by weight 9,9-bis(4-hydroxy-3-phenylphenyl)fluorene with a b value of 19.3, indicating the product is light yellow, is obtained. These examples clearly show that in addition to the problems with handling HCl(g) compared to aqueous hydrochloric acid, purity and especially color are sacrificed by using the HCl(g) as a catalyst, as taught by Takahashi '713. As discussed in the BACKGROUND ART section of the instant application, transparency is a very important quality for many of the applications for which fluorene derivatives are used. (*See*, page 1, lines 12-27 of the specification).

Accordingly, Takahashi '713 fails to teach or suggest each and every feature of the claimed invention. As such, Takahashi '713 cannot anticipate or render obvious the presently claimed invention. Therefore, Applicants respectfully request the withdrawal of all rejections under 35 U.S.C. § 102(b) and 103(a) based on Takahashi '713.

As indicated above, independent claim 1 positively recites, *inter alia*, that the catalyst used in the condensation reaction of the fluorenone and phenolic compound includes a hydrochloric acid **aqueous solution**. Applicants respectfully submit that the combination of Takahashi '713 and Shinagawa '530 fails to render obvious the presently claimed invention. As discussed above, Takahashi '713 fails to teach or suggest using a hydrochloric acid **aqueous solution** catalyst for a condensation reaction between fluorenone and phenolic compound to produce a fluorene derivative. Shinagawa '530 fails to cure this deficiency.

Shinagawa '530 discloses a method for producing 9,9-bis(hydroxyaryl)fluorene comprising subjecting fluorene and oxygen to a reaction in a solvent having a high boiling point in the presence of a caustic alkali and a phase-transfer catalyst to form a fluorenone. The resulting fluorenone is then reacted with a phenol in an organic solvent in the presence of an acid and a mercapto carboxylic acid. (*See*, Claim 1 of Shinagawa '530). Shinagawa '530, in describing the catalyst for the fluorenone and phenol reaction states that “the use of hydrogen chloride instead of sulfuric acid is publicly known. However, since the hydrogen chloride corrodes the equipment, the sulfuric acid is preferred commercially to the hydrogen

chloride.” (See, paragraph number [0014] of Shinagawa ‘530). Additionally, in all the Examples of Shinagawa ‘530, concentrated sulfuric acid is used as the acid catalyst.

Accordingly, Shinagawa ‘530 discloses the conventional use of concentrated sulfuric acid as a catalyst for the condensation reaction between fluorenone and a phenolic compound. Shinagawa ‘530 describes that by using an aromatic hydrocarbon solvent having a high boiling point as the solvent in the production of fluorenone, the safety of the process is improved. Shinagawa ‘530 also states that by using an inert organic solvent in the production process of 9,9-bis(hydroxyaryl)fluorene the amount of phenol can be reduced leading to process savings. (See, paragraph number [0024] of Shinagawa ‘530). Thus, Shinagawa ‘530 is drawn towards a safer method of producing fluorenone and using an organic solvent in the reaction of the produced fluorenone with a phenol. Shinagawa ‘530 is not drawn towards an improved aqueous catalyst for the reaction between the fluorenone and phenol. The conventional catalyst described by Shinagawa ‘530 is discussed in the BACKGROUND ART section of the specification of the instant application. (See, page 2, line 25 through page 3, line 19 of the specification). In those passages, Applicants describe the labor intensive treatment that is required due to the discharge of a sulfuric-acid containing waste fluid. Additionally, Applicants describe how the a fluorene derivate obtained from a concentrated sulfuric acid catalyzed reaction is characterized by a yellow color. Thus, additional purification leading to increased process times and cost is required.

Shinagawa ‘530 clearly fails to teach or suggest using a hydrochloric acid *aqueous solution* as a catalyst in a reaction between fluorene and a phenolic compound. Additionally, Shinagawa ‘530 only teaches using very concentrated sulfuric acid as the catalyst which is completely different from the *5 to 37% by weight* hydrochloric acid aqueous solution of claim 1. Thus, Shinagawa ‘530 fails to teach or suggest the use of a *hydrochloric acid* aqueous solution and Shinagawa ‘530 fails to teach or suggest the use of a *dilute* acid solution. Accordingly, Shinagawa ‘530 fails to cure the deficiencies of Takahashi ‘713. Therefore, the combination of Takahashi ‘713 and Shinagawa ‘530 cannot render the claimed invention obvious. Accordingly, Applicants respectfully request the withdrawal of the 35 U.S.C. § 103(a) rejection based on Takahashi ‘713 and Shinagawa ‘530.

## II. Newly Added Claims

Claims 8-20 have been added by the present amendment. As indicated above, independent claims 9 and 20 each positively recites, *inter alia*, that the catalyst used in the

condensation reaction of the fluorenone and phenolic compound includes a hydrochloric acid *aqueous solution*. Therefore, independent claims 9 and 20, as well as those claims which depend there from are patentable for the same reasons presented above with respect to claim 1.

III. Conclusion

All matters having been addressed and in view of the foregoing, Applicants respectfully request the entry of this Amendment, the Examiner's reconsideration of this application, and the timely allowance of all pending claims.

Applicant's Counsel remains ready to assist the Examiner in any way to facilitate and expedite the prosecution of this matter. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the Undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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